

FAILURE TIMES OF BEARINGS

2. Study Design and Data Collection

The inferences we may draw from the data depend crucially on the study's design and the way the data were collected. First observe that for each of the five types of material ten specimens were prepared. They were not selected randomly from any well-defined population. Therefore, the observed pattern cannot be inferred to hold in some general population, for example the population of all bearings made of the same material unless we assume that the bearings are representative of the population. This was probably the assumption made by the researchers in the experiment.

The fifty bearings made of the five types of material constitute the experimental units in the experiment. They were all subjected to the same (or approximately the same) amount of contact stress in a testing machine. It is well known that the stresses acting upon a material are usually random in nature. If we assume that the order in which the fifty bearings were tested was determined randomly and the testing machine was examined after each run, there is no reason to believe that the bearings from any of the five material groups were subjected to higher stress amount than the other bearings.

The response is time to fatigue failure in units of millions of stress cycles.

The experiment is an example of an unplanned comparison because no comparisons had been suggested before the experiment was conducted. We will examine the differences between all possible pairs of groups to detect actual group differences. The simultaneous level of confidence will be controlled.

The recorded times to fatigue failure are given in the table below in units of millions of test specimen stress cycles.

TYPE OF MATERIAL				
1 (P/M)	2 (CEVM)	3 (AISI-T-15)	4 (VIMAR)	5 (EX00007)
3.03	3.19	3.46	5.88	6.43
5.53	4.26	5.22	6.74	9.97
5.60	4.47	5.69	6.90	10.39
9.30	4.53	6.54	6.98	13.55
9.92	4.67	9.16	7.21	14.45
12.51	4.69	9.40	8.14	14.72
12.95	5.78	10.19	8.59	16.81
15.21	6.79	10.71	9.80	18.39
16.04	9.37	12.58	12.28	20.84
16.84	12.75	13.41	25.46	21.51